

ERDC/CERL SR-04-27

Construction Engineering
Research Laboratory



**US Army Corps
of Engineers®**

Engineer Research and
Development Center

Industrial Process and Energy Optimization

**Proceedings of the Industry Workshop,
Gettysburg, PA, 25-27 February 2004**

Mike C.J. Lin and Alexander Zhivov

September 2004



Industrial Process and Energy Optimization: Proceedings of the Industry Workshop, Gettysburg, PA, 25-27 February 2004

Mike C.J. Lin and Alexander Zhivov

*Construction Engineering Research Laboratory
PO Box 9005
Champaign, IL 61826-9005*

Final Report

Approved for public release; distribution is unlimited.

Prepared for U.S. Army Corps of Engineers
 Washington, DC 20314-1000

Under Work Unit "Energy & Utilities Readiness"

ABSTRACT: Many Army industrial processes are unique and are not addressed by the U.S. Department of Energy (DOE) research program. The Engineer Research and Development Center, Construction Engineering Research Laboratory (ERDC-CERL) at Champaign, IL has initiated a research project "Industrial Process and Energy Optimization," which will: (1) work with the U.S. Army Materiel Command (AMC) to determine Department of Defense (DOD) requirements and user needs related to industrial facilities; (2) benchmark critical industrial processes for energy consumption and other production costs to support transformation strategy; (3) minimize energy loads and optimize operation of building energy systems; (4) develop a suite of tools for the DOD industrial base to lower production costs; and (5) demonstrate these tools through process optimization assessments and showcases at selected installations. To support these objectives, a workshop was organized and held 25-26 February 2004 in Gettysburg, PA. This workshop assembled DOD and DOE policy makers, installation managers, energy researchers and contractors, and equipment manufacturers to share information and to determine the needs related to industrial facilities energy management and to scope future activities. These proceedings include the content of the workshop presentations in Adobe Acrobat® PDF format.

DISCLAIMER: The contents of this report are not to be used for advertising, publication, or promotional purposes. Citation of trade names does not constitute an official endorsement or approval of the use of such commercial products. All product names and trademarks cited are the property of their respective owners. The findings of this report are not to be construed as an official Department of the Army position unless so designated by other authorized documents.
DESTROY THIS REPORT WHEN IT IS NO LONGER NEEDED. DO NOT RETURN IT TO THE ORIGINATOR.

Contents

Conversion Factors	iv
Preface.....	v
1 Introduction	1
Background.....	1
Objective	2
Approach	3
Scope.....	3
Mode of Technology Transfer	3
Report Documentation Page.....	7

Conversion Factors

Non-SI* units of measurement used in this report can be converted to SI units as follows:

Multiply	By	To Obtain
acres	4,046.873	square meters
cubic feet	0.02831685	cubic meters
cubic inches	0.00001638706	cubic meters
degrees (angle)	0.01745329	radians
degrees Fahrenheit	$(5/9) \times (^\circ\text{F} - 32)$	degrees Celsius
degrees Fahrenheit	$(5/9) \times (^\circ\text{F} - 32) + 273.15$	kelvins
feet	0.3048	meters
gallons (U.S. liquid)	0.003785412	cubic meters
horsepower (550 ft-lb force per second)	745.6999	watts
inches	0.0254	meters
kips per square foot	47.88026	kilopascals
kips per square inch	6.894757	megapascals
miles (U.S. statute)	1.609347	kilometers
pounds (force)	4.448222	newtons
pounds (force) per square inch	0.006894757	megapascals
pounds (mass)	0.4535924	kilograms
square feet	0.09290304	square meters
square miles	2,589,998	square meters
tons (force)	8,896.443	newtons
tons (2,000 pounds, mass)	907.1847	kilograms
yards	0.9144	meters

* *Système International d'Unités* ("International System of Measurement"), commonly known as the "metric system."

Preface

This study was conducted for Headquarters, U.S. Army Corps of Engineers (HQUSACE) under Project 4A262784AT45, “Energy Technologies Applied to Military Facilities”; Work Unit “Energy & Utilities Readiness.” The technical monitor was Mr. Gary Schanche, CEERD-CV-T.

The work was performed by the Energy Branch (CF-E) of the Facilities Division (CF), Construction Engineering Research Laboratory (CERL). The CERL Principal Investigator was Dr. Mike Lin. The technical editor was William J. Wolfe, Information Technology Laboratory. Dr. Thomas Hartranft is Chief, CEERD-CF-E, and Michael Golish is Chief, CEERD-CF. The associated Technical Director was Gary W. Schanche, CEERD-CV-T. The Director of CERL is Dr. Alan W. Moore.

CERL is an element of the U.S. Army Engineer Research and Development Center (ERDC), U.S. Army Corps of Engineers. The Commander and Executive Director of ERDC is COL James R. Rowan, and the Director of ERDC is Dr. James R. Houston.

1 Introduction

Background

The current Army industrial base consists of facilities and installations that produce ammunition, store munitions, manufacture components, and maintain and overhaul equipment. Many of these facilities and their mechanical and energy systems (which were likely designed without much consideration of energy conservation, system security and reliability) are near the end of their useful life. Additionally, Executive Order 13123 Section 203 directs all Federal industrial facilities to reduce energy consumption by 20 percent from 1990 to 2005. That figure was further increased to 25 percent by 2010.

Army installations are generally unable to quantify and control industrial process energy consumption due to high monitoring costs and frequent task changes. Most installation Directorates of Public Works (DPWs) have insufficient engineering staffing levels, and training/experience to meet energy optimization needs. Most of U.S. Army Materiel Command (AMC) industrial processes are unique and are not addressed by the DOE research program and research and development (R&D) efforts. An AMC transformation White Paper approved by General Paul Kern (July 2003), calls for adoption of a “lean thinking” philosophy at AMC industrial facilities through “improved use of space, reduced process times, waste, and costs, enhanced customer satisfaction, increased efficiency, and saved Army precious resources.”

The Engineer Research and Development Center at Champaign, Construction Engineering Research Laboratory (ERDC-CERL), in collaboration with other Department of Defense (DOD) partners, U.S. Department of Energy (DOE), International Energy Agency, Academia, and energy saving performance contractors has initiated the “Industrial Process and Energy Optimization” research project, which will:

- work with AMC to determine DOD requirements and user needs related to industrial facilities
- benchmark critical industrial processes for energy consumption and other production costs to support transformation strategy, which includes process integration, consolidation and cost reduction
- minimize energy loads and optimize operation of building energy systems

- develop a suite of tools for the DOD industrial base to lower production costs through process and energy optimization, while operating at reduced and full capacity levels
- demonstrate these tools through several process optimization assessments and show-cases at selected installations
- train installation energy managers and their contractors in the use of this suite of tools
- assist DOD (where needed) in transformation efforts.

The Industry Workshop summarized in this document was aimed at meeting the first project objective, of determining the DOD requirements and user needs. The workshop took place 25-26 February 2004 at the Best Western Gettysburg Hotel, in Gettysburg, PA. This site was selected because of its proximity to Washington, DC and to Letterkenny Army Depot, which facilitated an onsite application tour 27 February 2004. This Workshop assembled DOD and DOE policy makers, installation managers, energy researchers and contractors, and equipment manufacturers to share information and to determine the needs related to industrial facilities energy management and to scope future activities. Participants made formal presentations. These proceedings include the content of those presentations.

Objective

The workshop objectives were to:

1. Define the scope of the study (types of processes and buildings to consider, climatic regions of interest, etc.) based on the expressed needs from AMC, Office of Assistant Chief of Staff for Installation Management (OACSIM), Installation Management Agency (IMA), etc.
2. Develop a working plan for execution and assign tasks among the project participants
3. Gain support from end-users (Depots, Arsenal) by providing previews of potential outcomes from the project through a number of formal presentations
4. Develop a preliminary list of demo/show-case candidates
5. Receive first-hand information about the current status and needs of a typical Army manufacturing/maintenance facility through the Letterkenny technical tour following the workshop.

Approach

CERL planned an international industry workshop to advance discussion on the topic of “Industrial Process and Energy Optimization,” which was held 25-26 February 2004. The workshop was publicized through mailings and the World Wide Web (WWW). Participants were invited to make formal presentations and to submit the content of their presentations for publication. Table 1 lists the workshop program and notes the presentations that were submitted for publication. Hyperlinks in Table 1 link directly to the workshop presentations that were available for inclusion in this Proceedings.

Scope

This report contains the Microsoft® PowerPoint® graphical slide presentations given at the *Industry Workshop*, 25-26 February 2004, included here in Adobe Acrobat® PDF format. The report includes no text summary of the verbal presentations that accompanied the electronic slides.

Mode of Technology Transfer

This proceedings will be made accessible through the World Wide Web (WWW) at URL: <http://www.cecer.army.mil>

Table 1. Workshop Program			
Included	Date/Time	Presenter	Topic
Wednesday, 25 February 2004			
	7:30-8:00		Registration
	8:00-8:05	Dr. Alexander Zhivov, ERDC-CERL	Introduction to the Workshop
X	8:05-8:10	Mr. Gary Schanche	Industrial Activities Readiness
	8:10-11:30	Session 1. DOD Production Facilities' Needs	
X	8:10-8:30	Dr. Alexander Zhivov, ERDC-CERL.	Process and Energy Optimization at the Army Industrial facilities – project overview
X	8:30-9:00	Mr. Geza Cseri, HQAMC, Industrial Operations	AMC Organic Base Overview
X	9:00-9:10	Mr. David Williams, HQACSIM	ACSIM Energy Strategy for Industrial Facilities
X	9:10–9:40	Mr. David Osborn, Rock Island Arsenal	Energy Program at Rock Island Arsenal
X	9:40-10:10	Mr. Gary Gates, NAVFAC ENGCOM	Navy Energy Conservation Program
	10:10-11:00		Questions and Answers, Participants' Forum
	11:00-11:30		Coffee Break
	11:30-13:00	Session 2. DOD Tactical Equipment Maintenance Facilities' Needs	
X	11:30-11:45	Mr. Robert Woodson, HQDA ODCS	Tactical Equipment Maintenance Facilities (TEMF)
X	11:45-12:00	Dr. Alexander Zhivov, ERDC-CERL.	TEMF Standard Design
X	12:00-12:30	COL Garey Heumhreus, Fort Lewis	Energy & Utilities Readiness for the Army Industrial Activities. DOL Facilities
	12:30-13:00		Questions and Answers, Participants' Forum
	13:00-14:00		Lunch
	14:00-18:00	Session 3. DOD Industrial Facilities Energy Assessment Methodologies and Practices	
X	14:00-14:25	Mr. Alfred Woody, Albert Kahn Associates	Designing for Optimal Energy Use in Production Facilities
X	14:25-14:50	Dr. Mike Lin, CERL; Mr. Robert Lorand, SAIC	CERL PEPR program
X	14:50-15:15	Dr. Curt Bjork, Fastighet & Konsult AB, Sweden	Assessing Energy Use and Conservation in Commercial and Institutional Buildings
X	15:15-15:40	Mr. Walter Smith, ETSI	Process Energy Optimization Assessment: Features and Benefits

×	15:40-16:05	Mr. Donald Kasten, Rutgers University	DOE Industrial Assessment Centers
	16:05-16:30		Coffee Break
×	16:30-16:55	Mr. Michael Chimack, University of Illinois in Chicago, ERC	Industrial Energy Assessment
×	16:55-17:20	Mr. Bernd Leven, Stuttgart University, Germany	Energy Assessment Strategy and Energy Concepts for Industrial Facilities
	17:20-18:00		Questions and Answers, Participants' Forum
Thursday, 26 February 2004			
	8:00-8:10	Dr. Alexander Zhivov, ERDC-CERL	Introduction to the Second Day
	8:10-13:00	Session 4. Energy Adviser for Industrial Facilities and New Energy Saving Technologies for New and Existing Buildings	
×	8:10-8:35	Mr. Simon Wössner, Fraunhofer-Institut für Bauphysik, Germany	IEA Annex 36, Energy Concept Adviser - A New Internet-based Tool for Decision Makers and their Technical Staff
×	8:35-8:55	Dr. Michael McDonald, ORNL	Energy Saving and Process Technologies Development at ORNL
×	8:55-9:15	Mr. Donald Foster, LBNL	Energy Analysis, Benchmarking, and Industrial Innovations Methodology
×	9:15-9:35	Mr. Leon Shapiro, ADA Systems	Advanced Energy Saving Through The Use Of Evaporative Cooling And Energy Recovery In Hybrid HVAC Systems
×	9:35-9:55	Mr. Klas Haglid, Building Performance Equipment	Using Air-to-Air Energy Recovery in Industrial Applications to Comply with ASHRAE Standard 90.1 and Score with LEED/SpiRiT
×	9:55-10:20	Mr. John Seem, Johnson Controls	New Energy Saving Strategies for HVAC Control Systems
×	10:20-10:40	Mr. Steve Barnkow, Plymovent	Energy Savings with Scalable Source Capture Ventilation
	10:40-11:00		Coffee Break
×	11:00-11:20	Mr. Brian Becker, Ambirad	Aircraft Hangar Heating
×	11:20-11:30	Mr. Terry Hutchins, PALM International	Bi-Fold Covers on Process Tanks in the Cleaning Room Facility at the NADEP NAS North Island, San Diego.
×	11:30-11:40	Mr. Terry Hutchins, PALM International	Reduced Air Emissions for Hard Chrome Plating at the NADEP NAS North Island, San Diego
×	11:40-12:00	Mr. Richard Fisher, KE Fibertec	Textile Based Ventilation
×	12:00-12:20	Mr. Paul Stewart, Square D	Lighting Control Systems

×	12:20-12:40	Mr. Rich Glatt, Lindab.	Energy Conservation through Duct Leakage Reduction
	12:40-13:00		Questions and Answers, Participants' Forum
	13:00-14:00		Lunch
	14:00-17:00	Breakout Sessions: 1. DOD Industrial Facilities Needs, 2. Energy Assessment Methodology Collaboration, 3. Energy Adviser Collaboration, 4. R&D Collaboration	
×	17:00-17:30		Breakout Sessions Moderators' Reports [2] [3]
	17:30-18:00		Workshop Conclusion
Friday, 27 February 2004			
×	9:00-9:45	LTC Andy Smith	Overview of Letterkenny Army Depot activities and Energy-related Needs
	9:45-11:30	Mr. Joe Repasi	Tour of production facilities
	11:30-12:00		Lunch
	12:00-13:00	All Tour Participants	Brainstorming session

